

Two 12-inch Diameter Penetrations for Stochastic Cooling Penetration at 3 O'clock

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May 19, 2008

A pair of 12-inch penetrations is planned for the 3 O'clock sector for stochastic cooling. The penetrations will have an inside diameter of 12 inches and will be spaced 2.5 feet apart. The pipes will be 52 feet long and enter the tunnel 2 feet above the beam height. The angle from the beam line to the penetration opening is about 20 degrees.

Using an angle of 20 degrees and Figure 2.25 of Sullivan (ref 1) I arrive at an approximate attenuation of 5×10^{-5} for each penetration. For a maximum fault I will assume 1.14×10^{13} protons in a fault (see ref. 2). Using figure 2.2 of ref. 1 a dose of 814 rem is estimated³ at the beginning of the penetration. The estimated dose at the exit of the penetration is of the order of 40 mrem. Penetrations of a similar size (14-inch diameter and 40 feet long) at 10 O'clock had an estimated⁴ dose of 0.5 mrem.

It is expected that there will be substantial cables in the pipe, although no credit has been given for the additional dose reduction. The cables would produce a substantial reduction for the radiation.

I do not see a need for additional protection, posting, etc. for this penetration.

The penetrations must be inspected to ensure they meet the assumption used in this the radiation estimates presented here. **(CK-RHIC-FY09-532)**

The intent is not to conduct a fault study.

References

1. A.H. Sullivan, A Guide to Radiation and Radioactivity Levels near High Energy Particle Accelerators, 1992.
2. A.J. Stevens Memorandum to D. Beavis, "Estimate of Dose at Exit of Cyro Penetrations", Jan. 03, 1997.
3. The table is multiplied by a factor of 2 to account for future changes in the neutron dose equivalence factors, the 90 degree curve is used, and a distance to 1.92 meter to the penetration opening in the tunnel.
4. See the minutes of the RSC meeting of Oct. 19, 1998. Some of the difference can be related to different geometry, different source term, and different attenuation formula for the penetration.